9-08 PAINTS

9-08.1 Raw Materials

The acceptance of particular lots of raw materials shall in no way obligate the Engineer to accept lots of finished paint that do not conform to the requirements of these Specifications. When not specifically detailed, the raw materials shall meet the requirements of the applicable Federal Specification in effect at the time of manufacture. Products not covered by State or Federal Specifications shall be of top quality, meeting prevailing commercial standards. Raw materials for paints shall conform to the requirements of the Specifications listed below.

Alkyd resin solution, Federal TT-R-266, Type I or Type II.

Aluminum paste, ASTM D 962, Type 2, Class B. Paints made with the paste shall be smooth and highly lustrous.

Anti-skinning agent shall have no deleterious effect on the drying time of the finished paint. It shall effectively prevent skinning when added in the amounts specified in each formula and tested in accordance with Federal Test Std. No. 141a, Method 3021.

Aromatic petroleum thinner — water white low aniline petroleum solvent Kauri-Butanol value ..... 70 (min.)

Barium sulfate pigment, ASTM D 602.

Chrome oxide green, ASTM D 263. The tinting properties shall be such that the standard color of the formulas using chrome oxide green can be produced without departing from the limits of composition given in those formulas.

Chrome yellow pigment and paste, ASTM D 211, Type III.

Fibrous magnesium silicate (talc), ASTM D 605.

Lampblack pigment and paste, ASTM D 209.

Liquid drier, ASTM D 600.

Mineral spirits, ASTM D 235.

Raw linseed oil, ASTM D 234.

Red iron oxide pigment, ASTM D3721, D3722 & D3724.

Silica shall be finely ground amorphous or crystalline material. It shall have a maximum oil absorption of 50 when tested in accordance with ASTM D 281.

Soya lecithin shall be pure.

Spar varnish, Federal TT-V-119.

Titanium pigments, ASTM D 476. Titanium dioxide for use in exterior white paints shall conform to Type II. Titanium pigments used in tinted paints and enamels shall be exterior chalk resistant, Type III.

Turpentine shall be gum spirits of turpentine, ASTM D 13.

Yellow iron oxide, hydrated, ASTM D 768.

Zinc oxide pigment and paste, ASTM D 79.

Zinc yellow (zinc chromate), ASTM D 478.

Raw materials not specifically covered shall meet current Federal Specifications for said material.

9-08.2 Paint Formulas — General

All paints shall be made from materials meeting the requirements specified in Section 9-08.1. The paint shall be made in accordance with the following formulas and shall meet the requirements set forth above as well as the special requirements set forth for each formula. The formulas are stated in terms of dry pigment. Each formula shall contain the specified raw materials which shall be proportioned to give the compositions in percentages by weight or parts by weight, as shown in the formulas that follow.

Formula A-5-61 — Vinyl Pretreatment

The primer shall meet the requirements of Federal Specification MIL-P-15328B or MIL-P-15328C, Primer Pretreatment (Formula 117B for Metals).

Vinyl Wash Primer shall be mixed by adding 1 volume of acid component (diluent) to 4 volumes of resin component (base solution) slowly and with constant stirring. The material shall be used within 8 hours of mixing. The wash primer coat shall be spray applied to all surfaces at a coverage rate of 250 to 300 square feet per gallon to yield a dry film of 0.5 to 0.9 mils thickness. If necessary to maintain a wet spray, additional thinning with normal Butanol or 99 percent Isopropanol will be allowed. Acid component above the required amount shall not be used for thinning. A drying time of one hour is required before recoating.

1. Butanol shall meet Federal Specification TT-B-846b Butyl Alcohol; Normal.
2. Isopropanol (99 percent) shall conform to ASTM D 770 Isopropyl Alcohol.

Formula A-9-73 — Galvanizing Repair Paint, High Zinc Dust Content

The galvanizing repair paint shall meet the requirements of Federal Specification MIL-P-21035 (Ships) Paint, High Zinc Dust Content, Galvanizing Repair.

Formula C-6-90 — Green Phenolic Finish Coat for Steel

Zinc chromate (dry pigment)	13.8 parts
Chrome green oxide (dry pigment)	16.1 parts
Titanium dioxide (dry pigment)	16.7 parts
Yellow iron oxide (dry pigment)	1.3 parts
Fibrous magnesium silicate (dry pigment)	5.0 parts
Aluminum stearate (dry pigment)	0.2 parts
Spar varnish	22.1 parts
Raw linseed oil	21.4 parts
Driers	1.0 parts
Anti-skinning agent	0.1 parts
Mineral spirits	2.3 parts
Weight per gallon (minimum)	12.5 lbs.
Viscosity at 70ºF	80 ± 8 K.U.
Grind (minimum)	6
Set to touch	4 hours
Dry hard	18 hours
Sag Index	7 min.
Test Requirements: Prior to shipment.	
Viscosity Adjustment: Mineral spirits to be added at the factory to achieve the specified viscosity.	

The proportions of tinting pigments may be varied to achieve the desired color. The color of the paint when dry must match the color of a standard C-6-90 color chip. Additional tinting pigments may be required.

Formula C-9-90 — Phenolic Finish Coat for Steel

Zinc Oxide (dry pigment)	10.0 parts
Titanium Dioxide (dry pigment)	21.0 parts
Fibrous Magnesium Silicate (dry pigment)	3.2 parts
Barium Sulfate (dry pigment)	12.8 parts
Tinting Pigments	5.9 parts
Treated Bentonite Clay (dry pigment)	0.2 parts
Anti-Sag Agent	1.9 parts
Raw Linseed Oil	12.6 parts
Spar Varnish	29.0 parts
Anti-Skin Agent	0.1 parts
Driers	1.0 parts
Mineral Spirits	1.8 parts
Xylene	0.5 parts
Weight per gallon (minimum)	12.3 lbs.
Viscosity 70ºF	80 ± 8 K.U.
Dry Hard (maximum)	18 hours
Set to Touch (maximum)	4 hours
Grind (N.S.) (minimum)	5
Sag Index (minimum)	4
Total Solids by Weight	80 ± 5%

Test Requirements: Prior to shipment.

Adjustments for tinting pigments and talc, solvents and chemical additives shall be made at the factory to achieve the desired color and physical characteristics. A fungicide, N-(Trichloromethylthio) phthalimide shall be added at the rate of 3 pounds per 100 gallons.

C-10-83 — Vinyl Finish Coat

Vinyl Finish Coat shall conform to the following Specifications:

Pigment (12 Percent Minimum by Mass)

A combination of titanium dioxide and colored pigments or a combination of colored pigments such that the resultant paint when dry matches the color sample available at the Project Engineer's office.

Vehicle (88 Percent Maximum by Mass)

Vinyl Resin Type II[1]	9.1 parts
Vinyl Resin Type III[2]	9.1 parts
Tricresyl Phosphate	3.4 parts
Methyl Isobutyl Ketone	39.2 parts
Toluene	39.2 parts
	100.0

[1]Vinyl Resin Type II shall be hydroxyl containing vinyl chloride-acetate copolymer. It shall contain 89.5 to 91.5 percent (by weight) vinyl chloride, 2.0 to 5.5 percent vinyl acetate and 5.3 to 7.0 percent vinyl alcohol. It shall produce results in the specified formulations equal to the Bakelite Corporation Vinylite resin VAGH.

[2]Vinyl Resin Type III shall be a vinyl chloride-acetate co-polymer of medium average molecular weight and shall contain 85 to 88 percent vinyl chloride and 12 to 15 percent vinyl acetate by weight. It shall produce in the specified formulations results equal to Bakelite Corporation Vinylite resin VYHH.

Lampblack shall be ground in the Vinyl Finish Coat vehicle to yield a smooth well ground paint, Black Vinyl Tinting Paste, satisfactory for tinting either the Vinyl-Red Lead Primer or Vinyl Finish Coat.

The Vinyl Finish Coat and Vinyl Tinting Paste shall be ground to a fineness of not less than 5 when testing in accordance with Federal Test Method Standard No. 141b, Method 4411.1.

Vinyl Thinner shall be composed of the following materials:

Toluene	90 percent by volume
Methyl Isobutyl Ketone	10 percent by volume

The paints as received will require thinning with from 20 to 35 percent by volume of Vinyl Thinner to maintain a wet spray.

Formula D-1-57 — Aluminum Paint

Aluminum paste Type 2 Class B	2.0 lbs.
Spar Varnish	1.0 gallon

Aluminum paint shall be mixed on the job site, and only enough for one day shall be mixed at a time. The weighed amount of paste shall be placed in a suitable mixing container and the measured volume of vehicle then poured over it. The paste shall be incorporated by vigorous stirring with a paddle.

Test Requirements: Prior to mixing.

Formula D-4-57 — Black Enamel

The enamel shall meet the requirements of Federal TT-E-529 Black Enamel, Synthetic, Semi Gloss.

Test Requirements: This enamel will be sampled and tested in the ready-mixed form.

Formula D-5-83 — White Guardrail Paint (Alkyd Vehicle)

Titanium dioxide (dry pigment)	28.1 parts
Zinc oxide (dry pigment)	10.9 parts
Fibrous magnesium silicate (dry pigment)	4.3 parts
Aluminum stearate (dry pigment)	0.5 parts
Alkyd vehicle	37.0 parts
24% lead naphthenate drier	0.4 parts
6% Cobalt naphthenate drier	0.2 parts
6% Manganese naphthenate drier	0.2 parts
Anti-skinning agent	0.2 parts
Mineral spirits	18.2 parts
Weight per gallon (minimum)	11.0 lbs.
Viscosity at 70ºF	80-90 K.U.
Nonvolatile content (minimum)	70.2%
Grind (minimum)	4
Hiding power (maximum scale reading)	30
Set to touch	4 hours
Dry hard	18 hours
Sag Index	7 min.

Test Requirements: Prior to shipment.
Viscosity Adjustment: Mineral spirits will be added at the factory to achieve the specified viscosity.

This formula is to be used over primed or previously painted surfaces.

Formula E-1-57 — White for Wood Structures

The material shall conform to Federal TT-P-102, Class A.

Test Requirements: This paint will be sampled and tested in the ready-mixed form.

Primer: Turpentine may be added to the above paint in quantities not to exceed 1½ pints per gallon of paint for use as a primer.

Formula E-2-62 — Primer for Wood

The primer shall be a ready mixed priming paint for use over unpainted wood surfaces. It shall meet the requirements of Federal Specification TT-P-25 Primer, Paint, Exterior.

Test Requirements: This paint shall be sampled and tested in the ready-mixed form.

Formula F-3-64 — Orange Equipment Enamel

The enamel shall meet the requirements for Enamel, Alkyd, Gloss, Federal Specification TT-E-489, except that the Sag Index shall be seven minimum. The color, when dry, shall match that of Federal Standard No. 595, color 12246.

Test Requirements: When manufactured on Contract or Purchase Order for maintenance use, the enamel will be sampled and tested in the ready-mix form. No factory inspection will be required; however, a 1 pint sample representing the batch must be submitted to the Materials Laboratory for approval before use.

For factory application to individual items of new equipment, samples of the enamel will not be required; however, the equipment manufacturer must match the color and certify the quality of enamel used.

Formula H-1-83 — Primer for Concrete

Titanium dioxide	5.0 parts
Calcium carbonate	19.7 parts
Fibrous magnesium silicate	6.8 parts
Silica	6.8 parts
Spar varnish	52.3 parts
Mineral spirits	9.4 parts
Weight per gallon (minimum)	9.8 lbs.
Drying time (for testing purposes only)	18 hours
Viscosity at 70ºF	65-75 K.U.

Consistency: The paint shall not thicken after manufacture to an extent sufficient to impair its brushing qualities.
Test Requirements: Prior to shipment.

Formula K-1-83 — Exterior Acrylic Latex Paint-White

This paint shall meet the requirements of Federal Specification TT-P-19, Paint, Acrylic Emulsion, Exterior, except that the viscosity shall be 75-85 K.U.

This paint may be used self-primed in multiple coats over salts treated wood and on interior and exterior masonry surfaces.

Test Requirements: This paint will be sampled and tested in the ready-mixed form.

Formula K-2-83 — Traffic Signal Yellow Enamel

Traffic signal yellow enamel shall meet the provision of Federal Specification TT-E-489 — Enamel, Alkyd, Gloss — and shall match the color of "Standard Interstate Yellow."

Formula A-11-99 — Primer, Zinc Filled Single Component, Moisture-Cured Polyurethane

Zinc rich primer shall meet the following requirements:

Vehicle Type: Moisture-cured polyurethane

Pigment Content: 80% minimum zinc by weight in dry film.

Volume Solids: 60% plus or minus 3%.

Minimum wt./gal. 22.0 pounds.

Formula B-11-99 — Intermediate and Stripe Coat, Single Component, Moisture Cured Polyurethane

Vehicle Type: Moisture-cured polyurethane

Pigment: A minimum of 3.0 lbs. of micaceous iron oxide per gallon.

Intermediate and any stripe coat shall meet the following requirements:

Minimum volume solids 50%.

A minimum of 3.0 lbs./gal. of micaceous iron oxide.

The intermediate coating must be certified by the manufacturer to be able to be recoated by the top coat in a minimum of 4 days.

When used as a universal primer on previously painted surfaces, the intermediate coat must not lift the undercoats and must adhere well to the painted surface, to bare steel, aluminum, or galvanized surfaces.

Formula C-11-99 — Top Coat Single Component, Moisture Cured Polyurethane

Vehicle Type: Moisture-cured aliphatic polyurethane

Color: Match Federal Standard 595b

The Top Coat shall meet the following requirements:

The resin must be an aliphatic urethane.

Minimum volume solids 50%.

The top coat shall be a gloss.

Any evidence of aromatic rings, or more than 0.7% free isocyanate monomer as a percent of total solids will not be accepted.

9-08.3 Inspection Requirements General

The manufacturer shall notify the Engineer of the date on which manufacture will be started, and the Engineer shall have the right to inspect all details of the manufacturing process.

Quantities of 20 gallons or less of the above formulas will be accepted without inspection upon the manufacturer's notarized certificate. This certificate shall contain a statement by the manufacturer to the effect that the material meets the formula Specification, and shall include a list of materials and quantities used. One copy of the certificate shall accompany the paint when shipped and one copy with a sample of the paint shall be sent to the Materials Laboratory. The paint may be used at once without further release from the Materials Laboratory.

9-08.4 Process of Manufacture

The following process of manufacture shall be used for each paint except aluminum paint. Pigments shall be ground thoroughly in appropriate portions of the specified vehicle to form a paste meeting the requirements set forth in Section 9-08.4(6).

The grinding shall be done in a mill approved by the Engineer. The use of the "colloid" type of mill will not be approved. Weighed quantities of the paste and weighed or measured quantities of the vehicles shall then be mixed thoroughly and strained, if necessary, to form a paint free from skins, lumps, and foreign materials.

9-08.4(1) Viscosity Adjustment

The volatile thinner content of the paint shall be adjusted at the factory to meet the required viscosity, but in no case shall the resultant weight per gallon and nonvolatile content of the paint be below that specified in the formula.

9-08.4(2) Weight Variations

The weight per gallon of the paint in any lot shall not be less than that stated in the formula. A "lot" as used in this section shall be the quantity of paint ground at one time by any one mill.

9-08.4(3) Drying Time and Quantity of Drier

The paint shall dry within the length of time stated in each formula but shall not contain sufficient quantities of drier to cause the paint to dry to a nonuniform or nonelastic film. The manufacturer will be permitted to vary the quantity of drier given in the formula sufficiently to accomplish the above results.

9-08.4(4) Working Properties

The paint shall contain no caked material that cannot be broken up readily by stirring. When applied to a clean vertical surface, the paint shall dry without running, streaking, or sagging.

9-08.4(5) Storage Properties

Paints manufactured under these Specifications shall show no skin over the surface after 48 hours in a partially filled container, when tested as outlined in Federal Test Method Standard No. 141. A slight amount of skin or gel formation where the surface of the paint meets the side of the container may be disregarded. Variable percentages of anti-skinning agents are shown in those formulas set forth above that are susceptible to undesirable skin formation. The manufacturer will be allowed to vary the amount of anti-skinning agent given in the formulas provided the above results are accomplished and provided the paint does not dry to a nonuniform or nonelastic film.

9-08.4(6) Fineness of Grinding

The paint shall be ground so that all particles of pigment will be dispersed and be coated with vehicle, and the residue on a 325 sieve will not exceed 1 percent by weight of the pigment.

9-08.4(7) Standard Colors

When the paint is required to match a standard color, the manufacturer may obtain a sample of the required color without cost upon application to the Materials Laboratory, P.O. Box 47365, Olympia, Washington 98504-7365.

9-08.4(8) Containers

Each container shall be filled with paint and sealed airtight. Each container shall be filled with the amount of paint required to yield the specified quantity when measured at 70ºF.

All paint shall be shipped in new suitable containers having a capacity not greater than 5 gallons. Each container shall be marked with a suitable number to identify the particular batch from which it was filled.

9-08.5 Test Methods

As set forth in Section 9-08.2, all paints shall meet the special requirements set forth for each formula. The test methods used to check those special requirements shall be as specified in the Washington State Department of Transportation *Materials Manual* or the corresponding test method covered by Federal Test Method Standard No. 141. When test methods are not covered by the above, applicable ASTM methods shall be followed.

9-08.6 Shipping

Except for lots of paint in quantities of 20 gallons or less which are accepted upon the manufacturer's certificate, the manufacturer shall not ship any lot of paint until the paint has been tested and released by the Washington State Department of Transportation State Materials Laboratory. This release will not constitute final acceptance of the paint. Final acceptance will be based on inspection or testing of job site samples as determined by the Engineer.

9-08.7 Field Samples

Because of the volatility of the solvents used in the paint, the upper limit on viscosity shall be waived on all paint samples taken in the field.